



SEQUENCE LISTING

<110> Toni, Kutchan
Anthony, Fist
David, Atkins
Meinhart, Zenk

<120> CODEINONE REDUCTASE FROM ALKALOID POPPY

<130> J&J-1825

<140> 09/937665

<141> 2001-09-26

<150> PCT/AU00/00249

<151> 2000-03-24

<150> AU PP 9463

<151> 1999-03-26

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<170> PatentIn version 3.1

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<220>

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gtngtctaac gtcancggnnc nccntt

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<223> n = i

<220>
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<222> (6)..(6)
<223> n = c or g

<220>
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<222> (18)..(18)
<223> n = t or c

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<223> n = t or c

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cancanttag tncacctnta c

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<222> (9)..(9)
<223> n = c or t

<220>
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<223> n = a or g

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<222> (23)..(23)
<223> n = g or c

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<223> n = i

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<223> n = i

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<223> n = i

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<222> (27)..(27)
<223> n = i

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atggagagta atggtgtacc t 21

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<212> DNA
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<220>
<223> RT-PCR Primer

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tctaccattc actcctgaca g 21

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atggctagca tggagagtaa tgggtgtacct atg 33

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<220>
<223> Primer

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cttctcaaga ccctactctt cctacctagg gaa 33

<210> 9
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Xaa Leu Gln Glu Leu Met Ala ,
1 5

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<220>
<223> peptide

<400> 10

Val Leu His Gln Ile Ala Val Ala Arg Gly Lys
1 5 10

<210> 11
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<220>
<223> peptide

<400> 11

Asp Asp Asp Glu Leu Phe Ile Thr Ser Lys
1 5 10

<210> 12
<211> 16
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<213> artificial sequence

<220>
<223> peptide

<400> 12

Ile Pro Asp Val Val Asn Gln Val Glu Met Ser Pro Thr Leu Gly Gln
1 5 10 15

<210> 13
<211> 7
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<223> x = any amino acid

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<211> 5

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<220>

<223> peptide

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<221> MISC_FEATURE

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<223> x = any peptide

<400> 14

Xaa Val Ala Gln Val

1

5

<210> 15

<211> 10

<212> PRT

<213> artificial sequence

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<223> peptide

<220>

<221> MISC_FEATURE

<222> (5)..(5)

<223> x = any amino acid

<400> 15

Ile Phe Asp Asn Xaa Leu Thr Ala Glu Asp

1

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 <212> PRT
 <213> artificial sequence

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 alfalfa

<400> 16

Lys Gln Gly Tyr Arg His Phe Asp Thr Ala Ala Ala Tyr Gly Ser Glu
 1 5 10 15

Gln Ala Leu Gly Glu Ala Leu Lys Glu Ala Ile Glu Leu Gly Leu Val
 20 25 30

Thr Arg Glu Glu Leu Phe Val Thr Ser Lys Leu Trp Val Thr Glu Asn
 35 40 45

His Pro His Leu Val Ile Pro Ala Leu Gln Lys Ser Leu Lys Thr Leu
 50 55 60

Gln Leu Asp Tyr Leu Asp Leu Tyr Leu Ile His Trp Pro Leu Ser Ser
 65 70 75 80

Gln Pro Gly Lys Phe Ser Phe Pro Ile Asp Val Ala Asp Leu Leu Pro
 85 90 95

Phe Asp Val Lys Gly Val Trp Glu Ser Met Glu Glu Ser Leu Lys Leu
 100 105 110

Gly Leu Thr Lys Ala Ile Gly Val Ser Asn Phe Ser Val Lys Lys Leu
 115 120 125

Glu Asn Leu Leu Ser Val Ala Thr Val Leu Pro Ala Val Asn Gln Val
 130 135 140

Glu Met Asn Leu Ala Trp Gln Gln Lys Lys Leu Arg Glu Phe Cys Asn
 145 150 155 160

Ala Asn Gly Ile Val Leu Thr Ala Phe Ser Pro Leu Arg Lys Gly Ala
 165 170 175

Ser Arg Gly Pro Asn Glu Val Met Glu Asn Asp Met Leu Lys Glu Ile
 180 185 190

Ala Asp Ala His Gly Lys Ser Val Ala Gln Ile Ser Leu Arg Trp Leu
 195 200 205

Tyr Glu Gln Gly Val Thr Phe Val Pro Lys Ser Tyr Asp Lys Glu Arg
 210 215 220

Met Asn Gln Asn Leu Cys
 225 230

<210> 17
 <211> 230
 <212> PRT
 <213> artificial sequence

<220>
 <223> reductase subunit of the 6'-deoxychalcone synthase complex from g
 lycyrrhiza

<400> 17

Lys Gln Gly Tyr Arg His Phe Asp Thr Ala Ala Ala Tyr Gly Ser Glu
 1 5 10 15

Thr Ala Leu Gly Glu Ala Leu Lys Glu Ala Arg Asp Leu Gly Leu Val
 20 25 30

Thr Arg Glu Glu Leu Phe Val Thr Ser Lys Leu Trp Val Thr Glu Asn
 35 40 45

His Pro His Leu Val Ile Pro Ala Leu Arg Lys Ser Leu Glu Thr Leu
 50 55 60

Gln Leu Glu Tyr Leu Asp Leu Tyr Leu Ile His Trp Pro Leu Ser Ser
 65 70 75 80

Gln Pro Gly Lys Phe Ser Phe Pro Ile Gln Val Glu Asp Leu Leu Pro
 85 90 95

Phe Asp Val Lys Gly Val Trp Glu Ser Met Glu Glu Cys Leu Lys Leu
 100 105 110

Gly Leu Thr Lys Ala Ile Gly Val Ser Asn Phe Ser Val Lys Lys Leu
 115 120 125

Gln Asn Leu Leu Ser Val Ala Thr Ile Arg Pro Ala Val Asn Gln Val

130

135

140

Glu Met Asn Leu Ala Trp Gln Gln Lys Lys Leu Arg Glu Phe Cys Thr
 145 150 155 160

Ala Asn Gly Ile Val Leu Thr Ala Phe Ser Pro Leu Arg Lys Gly Ala
 165 170 175

Ser Arg Gly Pro Asn Glu Val Met Glu Asn Asp Met Leu Lys Gly Ile
 180 185 190

Ala Glu Ala His Gly Lys Ser Ile Ala Gln Val Ser Leu Arg Trp Leu
 195 200 205

Tyr Glu Gln Gly Val Thr Phe Val Ala Lys Ser Tyr Asp Lys Glu Arg
 210 215 220

Met Asn Gln Asn Leu Gln
 225 230

<210> 18
 <211> 230
 <212> PRT
 <213> artificial sequence

<220>
 <223> reductase subunit of the 6'-deoxychalcone synthase complex from s
 oybean

<400> 18

Lys Gln Gly Tyr Arg His Phe Asp Thr Ala Ala Ala Tyr Gly Ser Glu
 1 5 10 15

Gln Ala Leu Gly Glu Ala Leu Lys Glu Ala Ile His Leu Gly Leu Val
 20 25 30

Ser Arg Gln Asp Leu Phe Val Thr Ser Lys Leu Trp Val Thr Glu Asn
 35 40 45

His Pro His Leu Val Leu Pro Ala Leu Arg Lys Ser Leu Lys Thr Leu
 50 55 60

Gln Leu Glu Tyr Leu Asp Leu Tyr Leu Ile His Trp Pro Leu Ser Ser
 65 70 75 80

Gln Pro Gly Lys Phe Ser Phe Pro Ile Glu Val Glu Asp Leu Leu Pro
85 90 95

Phe Asp Val Lys Gly Val Trp Glu Ser Met Glu Glu Cys Gln Lys Leu
100 105 110

Gly Leu Thr Lys Ala Ile Gly Val Ser Asn Phe Ser Val Lys Lys Leu
115 120 125

Gln Asn Leu Leu Ser Val Ala Thr Ile Arg Pro Val Val Asp Gln Val
130 135 140

Glu Met Asn Leu Ala Trp Gln Gln Lys Lys Leu Arg Glu Phe Cys Lys
145 150 155 160

Glu Asn Gly Ile Ile Val Thr Ala Phe Ser Pro Leu Arg Lys Gly Ala
165 170 175

Ser Arg Gly Pro Asn Glu Val Met Glu Asn Asp Val Leu Lys Glu Ile
180 185 190

Ala Glu Ala His Gly Lys Ser Ile Ala Gln Val Ser Leu Arg Trp Leu
195 200 205

Tyr Glu Gln Gly Val Thr Phe Val Pro Lys Ser Tyr Asp Lys Glu Arg
210 215 220

Met Asn Gln Asn Leu His
225 230

<210> 19
<211> 44
<212> PRT
<213> artificial sequence

<220>
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pium poppy

<400> 19

Glu Leu Phe Ile Thr Ser Lys Leu Gln Glu Leu Met Ala Ile Pro Asp
1 5 10 15

Val Val Asn Gln Val Glu Met Ser Pro Thr Leu Val Leu His Gln Ile

20

25

30

Ala Val Ala Arg Gly Lys Val Asn Glu Ile Pro Lys
 35 40

<210> 20
 <211> 1035
 <212> PRT
 <213> Papaver somniferum

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 <223> codeinone reductase isoform

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 <223> codeinone reductase isoform

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 1 5 10 15

Thr Gly Gly Thr Gly Thr Ala Cys Cys Thr Ala Thr Gly Ala Thr Cys
 20 25 30

Ala Cys Thr Cys Thr Cys Ala Gly Thr Thr Cys Cys Gly Gly Cys Ala
 35 40 45

Thr Thr Cys Gly Gly Ala Thr Gly Cys Cys Thr Gly Cys Thr Thr Thr
 50 55 60

Ala Gly Gly Thr Ala Thr Gly Gly Gly Ala Ala Cys Ala Gly Cys Thr
 65 70 75 80

Gly Ala Ala Ala Cys Ala Ala Thr Gly Gly Thr Ala Ala Ala Ala Gly
 85 90 95

Gly Ala Ala Cys Ala Gly Ala Ala Ala Gly Ala Gly Ala Gly Ala Ala
 100 105 110

Ala Thr Thr Gly Gly Cys Gly Thr Thr Thr Thr Thr Gly Ala Ala Ala
 115 120 125

Gly Cys Gly Ala Thr Ala Gly Ala Gly Gly Thr Cys Gly Gly Thr Thr
130 135 140

Ala Cys Ala Gly Ala Cys Ala Cys Thr Thr Cys Gly Ala Thr Ala Cys
145 150 155 160

Ala Gly Cys Thr Gly Cys Thr Gly Cys Ala Thr Ala Cys Cys Ala Ala
165 170 175

Ala Cys Thr Gly Ala Ala Gly Ala Gly Thr Gly Thr Cys Thr Thr Gly
180 185 190

Gly Thr Gly Ala Ala Gly Cys Thr Ala Thr Ala Gly Cys Thr Gly Ala
195 200 205

Ala Gly Cys Ala Cys Thr Thr Cys Ala Ala Cys Thr Thr Gly Gly Thr
210 215 220

Cys Thr Ala Ala Thr Ala Ala Ala Ala Thr Cys Thr Cys Gly Ala Gly
225 230 235 240

Ala Thr Gly Ala Ala Cys Thr Cys Thr Thr Cys Ala Thr Cys Ala Cys
245 250 255

Thr Thr Cys Cys Ala Ala Gly Cys Thr Cys Thr Gly Gly Thr Gly Cys
260 265 270

Gly Cys Thr Gly Ala Thr Gly Cys Thr Cys Ala Cys Gly Cys Thr Gly
275 280 285

Ala Thr Cys Thr Thr Gly Thr Cys Cys Thr Cys Cys Cys Thr Gly Cys
290 295 300

Thr Cys Thr Thr Cys Ala Gly Ala Ala Thr Thr Cys Thr Cys Thr Gly
305 310 315 320

Ala Gly Gly Ala Ala Thr Cys Thr Thr Ala Ala Ala Thr Thr Gly Gly
325 330 335

Ala Cys Thr Ala Thr Cys Thr Thr Gly Ala Thr Cys Thr Ala Thr Ala
340 345 350

Thr Thr Thr Gly Ala Thr Ala Cys Ala Cys Cys Ala Thr Cys Cys Gly
 355 360 365

Gly Thr Ala Ala Gly Cys Thr Thr Gly Ala Ala Gly Cys Cys Ala Gly
 370 375 380

Gly Gly Ala Ala Gly Thr Thr Thr Gly Thr Thr Ala Ala Cys Gly Ala
 385 390 395 400

Ala Ala Thr Ala Cys Cys Ala Ala Ala Gly Gly Ala Thr Cys Ala Thr
 405 410 415

Ala Thr Cys Cys Thr Thr Cys Cys Ala Ala Thr Gly Gly Ala Cys Thr
 420 425 430

Ala Cys Ala Ala Ala Thr Cys Thr Gly Thr Ala Thr Gly Gly Gly Cys
 435 440 445

Ala Gly Cys Cys Ala Thr Gly Gly Ala Ala Gly Ala Gly Thr Gly Thr
 450 455 460

Cys Ala Gly Ala Cys Cys Cys Thr Thr Gly Gly Cys Thr Thr Cys Ala
 465 470 475 480

Cys Thr Ala Gly Gly Gly Cys Ala Ala Thr Cys Gly Gly Gly Gly Thr
 485 490 495

Cys Thr Gly Thr Ala Ala Thr Thr Thr Cys Thr Cys Ala Thr Gly Cys
 500 505 510

Ala Ala Ala Ala Gly Gly Cys Thr Thr Cys Ala Ala Gly Ala Gly Thr
 515 520 525

Thr Gly Ala Thr Gly Gly Ala Ala Ala Cys Ala Gly Cys Cys Ala Ala
 530 535 540

Cys Ala Gly Cys Cys Cys Thr Cys Cys Ala Gly Thr Thr Gly Thr Gly
 545 550 555 560

Ala Ala Thr Cys Ala Ala Gly Thr Gly Gly Ala Gly Ala Thr Gly Ala
 565 570 575

Gly Cys Cys Cys Gly Ala Cys Thr Thr Thr Ala Cys Ala Thr Cys Ala

580

585

590

Ala Ala Ala Ala Ala Ala Thr Cys Thr Gly Ala Gly Gly Gly Ala Ala
 595 600 605

Thr Ala Thr Thr Gly Cys Ala Ala Gly Gly Cys Cys Ala Ala Thr Ala
 610 615 620

Ala Thr Ala Thr Cys Ala Thr Gly Ala Thr Cys Ala Cys Cys Gly Cys
 625 630 635 640

Ala Cys Ala Cys Thr Cys Ala Gly Thr Thr Thr Thr Gly Gly Gly Ala
 645 650 655

Gly Cys Cys Gly Thr Ala Gly Gly Thr Gly Cys Cys Gly Cys Cys Thr
 660 665 670

Gly Gly Gly Gly Cys Ala Cys Cys Ala Ala Thr Gly Cys Ala Gly Thr
 675 680 685

Thr Ala Thr Gly Cys Ala Thr Thr Cys Thr Ala Ala Gly Gly Thr Gly
 690 695 700

Cys Thr Thr Cys Ala Cys Cys Ala Gly Ala Thr Thr Gly Cys Thr Gly
 705 710 715 720

Thr Gly Gly Cys Cys Ala Gly Ala Gly Gly Ala Ala Ala Ala Thr Cys
 725 730 735

Thr Gly Thr Thr Gly Cys Cys Cys Ala Gly Gly Thr Thr Ala Gly Thr
 740 745 750

Ala Thr Gly Ala Gly Ala Thr Gly Gly Gly Thr Thr Thr Ala Cys Cys
 755 760 765

Ala Gly Cys Ala Ala Gly Gly Cys Gly Cys Gly Ala Gly Thr Cys Thr
 770 775 780

Thr Gly Thr Gly Gly Thr Gly Ala Ala Ala Ala Gly Thr Thr Thr Cys
 785 790 795 800

Ala Ala Thr Gly Ala Ala Gly Cys Gly Ala Gly Gly Ala Thr Gly Ala
 805 810 815

Ala Gly Gly Ala Ala Ala Ala Cys Cys Thr Thr Ala Ala Gly Ala Thr
820 825 830

Ala Thr Thr Thr Gly Ala Thr Thr Gly Gly Gly Ala Ala Cys Thr Ala
835 840 845

Ala Cys Gly Gly Cys Ala Gly Ala Ala Gly Ala Cys Ala Thr Gly Gly
850 855 860

Ala Ala Ala Ala Gly Ala Thr Cys Ala Gly Thr Gly Ala Gly Ala Thr
865 870 875 880

Thr Cys Cys Ala Cys Ala Ala Thr Cys Thr Ala Gly Ala Ala Cys Ala
885 890 895

Ala Gly Cys Thr Cys Thr Gly Cys Thr Gly Cys Thr Thr Thr Cys Thr
900 905 910

Thr Gly Thr Thr Ala Thr Cys Ala Cys Cys Gly Ala Cys Thr Gly Gly
915 920 925

Ala Cys Cys Thr Thr Thr Cys Ala Ala Ala Ala Cys Thr Gly Ala Ala
930 935 940

Gly Ala Ala Gly Ala Gly Thr Thr Cys Thr Gly Gly Gly Ala Thr Gly
945 950 955 960

Ala Gly Ala Ala Gly Gly Ala Thr Thr Gly Ala Ala Ala Cys Ala Thr
965 970 975

Cys Ala Ala Thr Thr Ala Thr Ala Gly Ala Thr Gly Gly Thr Ala Ala
980 985 990

Gly Thr Gly Ala Gly Gly Ala Cys Thr Gly Thr Cys Ala Ala Ala Ala
995 1000 1005

Ala Ala Gly Thr Ala Ala Thr Cys Ala Gly Thr Thr Thr Thr Thr
1010 1015 1020

Cys Cys Cys Thr Cys Cys Gly Thr Thr Thr Thr Gly
1025 1030 1035

<210> 21
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 <212> DNA
 <213> papaver somniferum

<220>
 <221> misc_feature
 <222> (1)..(966)
 <223> codeinone reductase isoform

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 ggtatgggaa cagttgaaac aatggaaaag ggaacagaaa gagagaaatt ggcgtttttg 120
 aatgcgatag aggtcggtta cagacacttc gatacagctg ctgcatacca aagtgaagag 180
 tgtcttggtg aagctatagc tgaagcactt caacttggtt taataaaaatc tcgagatgaa 240
 ctcttcatca cttccaagct ctggtgctgct gatgctcacg ctgatcttgt cctccctgct 300
 cttcagaatt ctctgaggaa tctcaaattg gagtaccttg atctatattt gatacaccat 360
 ccgtaagct tgaagccagg gaagcttggtt aacgaaatac caaaggatca tattcttcca 420
 atggactaca aatctgtatg ggcagccatg gaagagtgtc agacccttgg cttcactagg 480
 gcaatcggtg tcagtaattt ctcatgcaaa aagcttcaag agttgatggc aacagccaag 540
 atccctccag ttgtgaatca agtggagatg agcccgactt tacatcaaaa aaatctgagg 600
 gaatattgca aggccaataa tatcatgatc actgcacact cggttttggg agccataggt 660
 gctccatggg gcagcaacgc agttatggat tctaagggtgc ttcaccagat tgctgtggca 720
 agaggaaaaat ctgttgccca ggtagtatg agatggggtt accagcaagg cgcgagtctt 780
 gtggtgaaaa gtttcaatga agcgaggatg aaggaaaaacc ttaagatatt tgattcggaa 840
 ctaacggcag aagatatgga aaagatcagt gagattccgc aatctagaac aagctctgct 900
 gatttcttgt tatcaccgac tggacctttc aaaactgaag aagagttctg ggatgagaag 960
 gattga 966

<210> 22
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 <212> DNA
 <213> papaver somniferum

<220>
 <221> misc_feature
 <222> (1)..(966)
 <223> codeinone reductase isoform

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aaagcgatag aggtcggtta cagacacttc gatacagctg ctgcatacca aagtgaagag      180
tgtcttggtg aagctatagc tgaagcactt caacttggtc taataaaaatc tcgagatgaa      240
ctcttcatca cttccaagct ctggtgcgct gatgctcacg ctgatcttgt cctccctgct      300
cttcagaatt ctctgaggaa tcttaaattg gactatcttg atctatattt gatacaccat      360
ccggtaaagct tgaagccagg gaagtttggt aacgaaatac caaaggatca tacccttcca      420
atggactaca aatctgtatg ggcagccatg gaagagtgtc agacccttgg cttcactagg      480
gcaatcgggg tctgtaattt ctcatgcaaa aagcttcaag agttgatggc agcagccaag      540
atccctccag ttgtgaatca agtggagatg agcccgactt tacatcaaaa aaatctgagg      600
gaatattgca aggccaataa tatcatgatc actgcacact cggttttggg agccatatgt      660
gctccatggg gcagcaatgc agttatggat tctaagggtc ttcaccagat tgctgtggca      720
agaggaaaaat ctgttgccca ggtagtatg agatgggttt accagcaagg cgcgagtcta      780
gtggtgaaaa gtttcaatga agggaggatg aaggaaaaacc ttaagatatt tgattgggaa      840
ctaacggcag agaatatgga aaagatcagt gagattccgc aatctagaac aagctctgct      900
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gattga                                                                966

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<210> 23
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<212> DNA
<213> papaver somniferum

<220>
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<222> (1)..(966)
<223> codeinone reductase isoform

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ggatatgggaa cagctgaaac aatggtaaaa ggaacagaaa gagagaaatt ggcgtttttg      120
aaagcgatag aggtcggtta cagacacttc gatacagctg ctgcatacca aagtgaagag      180
tgtcttggtg aagctatagc tgaagcactt caacttggtt taataaaaatc tcgagatgaa      240

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ctcttcatca cttccaagct ctggtgcgct gatgctcacg ctgatcttgt cctccctgct	300
cttcagaatt ctctgaggaa tctcaaattg gagtatcttg atctatatatt gatacaccat	360
ccggtaaagct tgaagccagg gaaatttggt aacgaaatac caaaggatca tattcttcca	420
atggactaca aatctgtatg ggcagccatg gaagagtgtc agacccttgg cttcactagg	480
gcaatcgggtg tcagtaattt ctcatgcaaa aagcttcaag agttgatggc agcagccaag	540
atccctccag ttgtgaatca agtggagatg agccctactt tacatcaaaa aaatctgagg	600
gaatattgca aggccaataa tatcatgatc actgcacact cggttttggg agccataggt	660
gctccatggg gcagcaatgc agttatggat tctaagggtc ttcaccagat tgctgtggca	720
agaggaaaat ctgttgccca ggtagtatg agatgggttt accagcaagg cgcgagtctt	780
gtggtgaaaa gtttcaatga agggaggatg aaggaaaaacc ttaagatatt tgattgggaa	840
ctaacggcag aagatatgga aaagatcagt gagattccgc aatctagaac aagctctgct	900
gctttcttgt tatcaccgac tggacctttc aaaactgaag aagagttctg ggatgagaag	960
gattga	966

<210> 24
 <211> 154
 <212> DNA
 <213> papaver somniferum

<220>
 <221> misc_feature
 <222> (1)..(154)
 <223> partial sequence of codeinone reductase isoform

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tgtggtgaat caggtggaga tgtggccgac ttacatcaa aaaaatctga gggaatattg	60
caaggccaat aatatcatga tcaactgcaca ctcggttttg ggagccatag gtgctccatg	120
gggcagcaat gcagttatgg attctaaggt gctt	154

<210> 25
 <211> 291
 <212> DNA
 <213> papaver somniferum

<220>
 <221> misc_feature
 <222> (1)..(291)
 <223> partial sequence codeinone reductase isoform

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 aatctcaaat tggactacct tgatctatat ttgatacacc atccggtgaag cttgaagcca 120
 gggaagcttg ttaacgaaat accaaaggat catattcttc caatggacta caaatctgta 180
 tgggcagcca tggaagagtg tcagaccctt ggcttcacta gggcaatcgg tgtcagtaat 240
 ttctcatgca aaaagcttca agagttgatg gcaacagcca agatccctcc a 291